



### Life Cycle



### Production

Injection moulding is a **naturally low-waste process** as only the amount of plastic needed is forced in the mould. However, there is still a high **energy requirement** to do this.



### Use

In April 2023, **46%** of Britain's electricity came from **zero carbon sources**. Being plugged into the UK mains for the chainsaw to run, assuming the chainsaw is used for 1 hour at 2000W, it would produce **324g of carbon dioxide** each time.



### Distribution

The **transporting** of the chainsaws from the factory to the consumer and outlet stores creates a **high carbon footprint** given the manufacturer is based in the **Netherlands**.



### Maintenance

Any damaged parts would need to be **replaced by ordering/purchasing new ones**. An example of this would be the chain as it becomes dull overtime.



### Waste Disposal

The final increase in the chainsaws **carbon footprint comes from its disposal**. A large portion of the chainsaw can be recycled however this still is a high energy operation.



### Raw Material Extraction

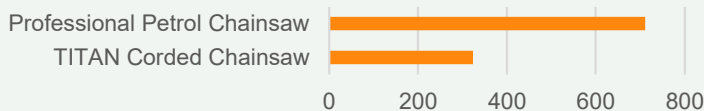
The extraction of materials needed to create the chainsaw require **high energy levels** and create **high emissions**. In addition to this the transport of these materials to the factory for production **increase its carbon footprint**.

## Current sustainable features

### Electric Chainsaw

The main suitable feature of the Titan corded electric chainsaw is that it is electric powered through mains. The alternatives being battery powered chainsaw which poses future problems with the disposing of the battery. The other alternative being a petrol chainsaw, whilst may be more effective it produces almost double the carbon emissions produced per hour by the corded titan chainsaw

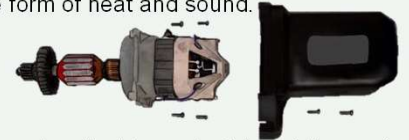
#### Carbon Emissions per hour of use



### Chain Lubrication and Efficient motor

With an inbuilt lubrication system, the chain is freer to spin. This design increases the efficiency of the chainsaw as there is less energy loss due to friction in the form of heat and sound.

#### Assembly



The chainsaw has been designed so that it can be taken fully apart with basic tools and without needing to damage the parts. This helps with separating the components for recycling. The exception to this being the Motor which is difficult to disassemble.

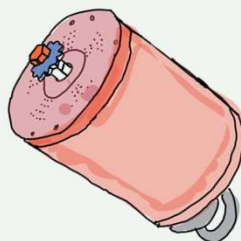
## Sustainable Improvements

### Alternate Materials

Swapping the glass fibre reinforced polyamide used to make the case of the chainsaw for a bioplastic such as Poly(lactic acid) (PLA) or polyhydroxyalkanoates (PHAs) will make the overall lifecycle of the chainsaw have a smaller carbon footprint. These bio plastics, being more biodegradable, carbon-neutral and renewable, would increase the sustainability. However, it should be noted that while they may be an eco-friendlier alternative, the production of bioplastics requires a lot of farming land, water usage and pollutants. In addition to this without the recycling infrastructure. The bioplastic chainsaws could still end up in the same recycling plant as its counterpart.

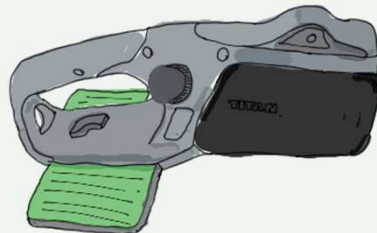
### Brushless Motor

The current motor in the chainsaw is a carbon brushed motor. If this was to be swapped with a brushless motor it would increase the efficiency and in turn, make the chainsaw more sustainable. Brushless motors are typically 85-90% efficient whereas brushed DC motors are only around 75-80% efficient.



### Solar Charged Battery

A redesign of the chainsaw to include a batter pack which is rechargeable by foldable solar panels would significantly decrease the carbon footprint of the chainsaw. A lot of the time when the chainsaw is being used it isn't being powered and instead is left outside. This time could be used charging the chainsaw.



#### References:

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